ABSTRACT

A watermark encoding system encodes an audio signal with both a strong and a weak watermark. The strong watermark identifies the content producer and is designed to survive all typical kinds of processing and malicious attacks. The weak watermark identifies the content as an original and is designed to be significantly removed as a result of most normal signal processing (other than A/D and D/A). The watermark encoding system has a converter to convert an audio signal into frequency and phase components and a mask processor to determine a hearing threshold for corresponding frequency components. The watermark encoding system also has a pattern generator to generate both the strong and weak watermarks and a watermark insertion unit to selectively insert either the strong or weak watermark into the audio signal. The watermark insertion unit adds the strong watermark to the audio signal when the signal exceeds the hearing threshold by a buffer value (e.g., 1-8 dB) and adds the weak watermark insertion unit when the signal falls below the hearing threshold by the buffer value. When the signal falls within the buffer area about the hearing threshold, the insertion unit takes no action. A watermark detecting system is equipped with a watermark detector that determines which block interval of the watermarked audio signal contains a watermark pattern and if the strong or weak watermark is present in that block interval of the signal.